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NOV 20 1972

Iowa Electric Light and Power Company
ATTN: Mr. Duane Arnold
President
Security Building
P. O. Box 351
Cedar Rapids, Iowa 52406

Gentlemen:

Our continuing review of amendments to the FSAR for the Duane Arnold Energy Center indicates that several areas of concern were not addressed and that several responses are not satisfactory. In order to avoid the delays associated with another "round of questions" on this project, we have elected to specify our requirements with respect to these areas of review as indicated in the enclosure.

In order to maintain our present licensing review schedule, we will need a detailed indication of your plans with regard to these requirements and expressed areas of concern by December 11, 1972. Please inform us within 7 days after receipt of this letter of your confirmation of the schedule or the date you will be able to provide the information necessary to permit us to complete our review in these areas. Since many of these areas of concern have been under discussion during the safety review and opportunity for resolution has been available, it is anticipated that further formal communication from us on these areas will be unnecessary. If you cannot meet our specified date or if your reply is not fully responsive to the points raised in the enclosure, it is highly likely that the overall schedule for completing the licensing review for this project will have to be reevaluated since reassignment of the staff's efforts will require completion of other assignments prior to returning to this project. The extent of the resultant delay in the review of the Duane Arnold application will most likely be greater than the extent of the delay in your response and may result in overall delays beyond your prospective fuel loading date.

Sincerely,

Original Signed by
Roger S. Boyd

R. S. Boyd, Assistant Director
for Boiling Water Reactors
Directorate of Licensing

Enclosure:
Statement of Requirements

CRESS T4016 F15 11/15/72						
OFFICE ▶	BWR-1:L	BWR:L	L:BWR's			
SURNAME ▶	Lear:rs	WRButler	RSBoyd			
DATE ▶	11/25/72	11/17/72	11/19/72			

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CRESS T4016 F15 11/15/72

Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U.S. GOVERNMENT PRINTING OFFICE: 1971 — 446 — 154

STATEMENT OF REQUIREMENTS
RESULTING FROM THE REGULATORY STAFF'S
REVIEW OF THE IOWA ELECTRIC LIGHT AND POWER COMPANY'S APPLICATION
RELATING TO
DUANE ARNOLD ENERGY CENTER
DOCKET NO. 50-331

2.0 SITE AND ENVIRONS

2.31 We require an amplification to the response to question 2.13 of Amendment 4 to the FSAR to include best estimates of the flight operations (takeoffs and landings) at the small landing strip 4 miles southeast of the plant. An appraisal of the potential for future expansion of this or other nearby airfields must also be provided. Describe also the potential for aircraft accidents and their effects at the facility.

2.32 We require an amplification to the response to question 2.17 of Amendment 4 to the FSAR to include description and results of the measurement and evaluation of on-site acceleration and related parameters affecting plant safety that result from blasting operations at the quarry located three miles from the facility.

2.33 Description and data in Table 2.7-1 of Section 2.7 of the FSAR must be modified, for the reasons stated, as follows:

a. The surface water sampling points, which are located in the Cedar River below the plant discharge, should be sampled on a proportional composite basis (i.e., daily or weekly samples having a volume proportional to the river flow rate composited for a monthly analysis) to assure that representative samples are collected. The two ground water samples associated with the Cedar Rapids municipal supply should be sampled on a daily proportional composite basis (for a weekly analysis).

b. The monthly sampling frequency proposed for milk is inadequate because of the relatively short half-life of I-131. It is recommended that the sampling frequency for the operational program be changed from monthly, monthly, and weekly to bi-weekly, weekly, and weekly, respectively.

c. The MPC notation in Table 2.7-1 must be modified to lower values since the "as low as practicable" considerations of 10 CFR Part 20 and Part 50 cannot result in concentrations as high as 10% MPC on a routine basis.

2.34 We require substantiation that runoff from rains as severe as those which could cause a local probable maximum flood (see U.S. Weather Bureau now NOAA Hydrometeorological Report No. 33 for drainage areas of approximately 10 square miles) will not overflow site storm drainage and adversely affect safety-related equipment, and may be safely passed and/or stored on the roofs of safety-related buildings without flooding their interiors through vents, stacks, or other penetrations.

2.35 We require a technical specification which will require plant shutdown for severe Cedar River flood levels greater than plant grade, elevation 757.0 feet above mean sea level datum (MSL). In addition, the technical specification must refer to appropriate preparedness plan(s) that will describe procedures for waterproofing plant accesses (see question 6, DAEC Preparedness Plan for details on required procedures).

2.36 In general, the type of flood protection you proposed in response to question 2.10c of Amendment 1 to the FSAR is considered adequate. However, we require placement of additional waterproofing material on plant accesses to reduce or eliminate possible leakage. Waterproofing material such as sheet plastic held in place with sandbags is considered acceptable. Your procedures for flood protection (see question 2.35 above and question 6, DAEC Preparedness Plan) must reflect these requirements.

2.37 Your estimate of the peak flow rate and corresponding water surface elevation for the Probable Maximum Flood (PMF), upon which much of the above discussion on a shutdown technical specification is based, appears adequate. However, completeness in assuring the accuracy of calculations requires that you provide:

a. A tabulation of the routing coefficients needed to attenuate runoff between each subarea and its downstream combination point.

b. Verification of your unit hydrograph and routing characteristics by presenting recorded and reconsituted historical flood hydrographs in the basin, annotated with hyetographs of effective storm rainfall.

2.38 The response to question 2.31 is inadequate. The shapes of the response spectra shown on sheets 1 through 6 of Figure 2.6-8 are not similar in shape. Explain the differences stating clearly how these spectra were developed.

3.0 REACTOR

3.22 The response to question 3.9 is not satisfactory. The inspection program delineated in Safety Guide 20 must be implemented. It is recommended that the inspection be performed after the cold flow testing provided the responses to the hot flow testing are compatible in magnitude and characteristics to the responses to the cold flow testing. State your intention to comply with these requirements and include your inspection program.

3.23 The response to question 3.4 is inadequate. Provide the following:

a. The methods that will be used for measuring the vibration amplitudes.

b. The acceptance criteria that will be implemented to confirm the structural integrity of the piping and pipe restraints in the event significant vibratory responses are present at various locations.

3.24 We require that you supplement your response to question 3.5 by providing a summary of the results of the seismic analysis used to confirm the functioning of seismic Category I mechanical equipment. Include a description of the methods and procedures used and the basis for assuring the proper functioning of the equipment during a seismic event.

3.25 Your response to question 3.13 in Amendment No. 7 to the FSAR was transmitted to us as information proprietary to the General Electric Company. We require a full explanation of the reasons why this information must be handled as proprietary under the provisions of Section 2.790 of 10 CFR Part 2. Other information submitted in future amendments that is considered proprietary by the applicant or his contractors must likewise be fully justified in writing before such material will be accepted as proprietary in nature.

5.0 CONTAINMENT

5.19 Protection of the ECCS pumps and associated operating instruments or components in the ECCS rooms of the Reactor Building has not

been adequately described for the situation caused by failure of a suction line, pump casing, or other component that causes internal flooding. Provide this information.

9.0 RADIOACTIVE WASTE SYSTEMS

9.24 Using the AEC source terms for radioactive gaseous release rates from an operating boiling water reactor, we have conservatively calculated that the dose to a child's thyroid resulting from consuming milk from the nearest cow could exceed 5 millirem per year, the numerical value of the design objective set forth in paragraph C2, Section II, Appendix I (proposed) to 10 CFR Part 50. In order to evaluate properly and balance the cost-benefits aspects of any corrective action, we require that you submit an analysis that will include a list of equipment and facility modifications with the associated cost estimate for providing a capability to meet the limiting numerical values indicated in Appendix I (proposed) to 10 CFR Part 50.

9.25 We require that the liquid radwaste effluent line to the cooling tower blowdown system contain an automatic shutoff valve that will close in the event the radioactivity concentration in the effluent equals or exceeds the limiting value established as described in your response to question 9.17 of Amendment 6 to the FSAR. These procedures to control liquid radwaste discharge must be appropriately documented by changes in the FSAR, P&ID's, and in the Technical Specifications.

9.26 We require further explanation and modification of P&ID's to describe how it is possible, as set forth on page 6-9.17-5 of Amendment 6 to the FSAR, that "the post treatment monitors automatically switch the process stream to charcoal bed treatment on receipt of a high radiation signal."

9.27 Figure 6-9.7-1 of Amendment 6 to the FSAR is a process flow sheet for the liquid radwaste system. On this diagram is shown a possible bypass of the radwaste evaporator by the chemical waste main stream that, if used, would result in a contradiction to the concept for chemical waste treatment stated in the enclosure to your letter, IE-72-473, dated August 15, 1972, to Mr. D. R. Muller. Describe your treatment procedures including details on bypass of the evaporator.

9.28 In order to permit independent analysis of postulated accidental release of liquid radwaste, we require that Table N.9-3 be expanded to show the individual isotopic inventory (curies) contained in all the tanks in the radwaste building.

10.0 AUXILIARY SYSTEMS

10.24 The description in Section 10.5 and in Appendix G (pages G.13-10 to G.13-12) of the FSAR does not provide sufficient information concerning the makeup system for the spent fuel pool. We require additional information as follows:

a. A P&I diagram and description to establish that there is a Class I water source to replenish spent fuel pool water lost by evaporation following the loss of the Class II fuel pool makeup system;

b. A P&I diagram and description to establish that the Class I to Class II interface between the spent fuel cooling system and the reactor heat removal system has double valve protection that assures that reactor heat removal system is not degraded by failure of the Class II system.

10.25 It is understood that failure of the circulating water pump bellows located in the pump house will flood the diesel driven fire pump, motor driven fire pump, and motor driven jockey fire pump. We require that there be fire protection available to serve the Class I equipment and power supplies previously served by the fire water system. Describe the methods and equipment to be used and the personnel protection while using the equipment.

10.26 We require that a P&I diagram and description be provided to establish the presence of a backflow preventer in the potable water system that will prevent possible contamination from this latter source entering the site well water system.

10.27 Your response to question 10.15 of Amendment 7 is inadequate. All pressure vessels identified in your response should be evaluated, assuming they will fail. Reevaluate parts (e) the possibility of the vessel or its parts to act as a missile, and (f) the protective measures taken to prevent the loss of function of adjacent equipment essential for the safe and maintained

reactor shutdown. We require that your reevaluation and subsequent corrective measures, if any, will prevent loss of equipment essential for a safe and maintained shutdown.

10.28 Your response to question 10.21 of Amendment 7 is inadequate. Assuming the maximum drop height, with the aid of drawings and sequence of lifting operations, we require an evaluation which will fully describe the consequences of, or measures taken to prevent the following from occurring:

a. The reactor vessel head is dropped onto an open reactor vessel;

b. The dryer-separator assembly is dropped into an open reactor vessel; and

c. A section of the shield plug comprising the floor at elevation 855 feet is dropped.

10.29 The drainage system serving the emergency diesel-generation rooms depicted on Figure 1-10.6-9 of Amendment 1 to the FSAR does not illustrate positive drainage and water removal by a pump or a sump equipped with a pump. We require that you submit plans to prevent buildup of drainage system water and provide positive steps to limit drainage system back-up when the check valves in this system are not leak-tight.

14.0 ACCIDENT ANALYSIS

14.17 You have orally stated that operation of the control room ventilation system in a contained or closed mode without outside air replenishment is not possible because the flow of air would include exhaust from the plant battery rooms. We require that you re-evaluate the effects from releases of gaseous contaminants resulting from postulated accidents to assure that loss of this mode of ventilating the control room does not cause an increase in the hazard to control room operators.

APPENDIX C - STRUCTURAL DESIGN AND LOADING CRITERIA

QC1.13 The response to question QC1.4 is not satisfactory. Describe the three-dimensional mathematical model used for the seismic analysis of the nonsymmetrical control building including sketches. Include the torsional degrees of freedom or show by actual calculations that their inclusion does not significantly affect the response. Show that the torsional response of symmetrical buildings is insignificant.

QC1.14 The response to question QC1.7 is not satisfactory. The criteria used to account for composite damping in a coupled system may not be conservative. Provide a comparison of the damping method used with the commonly accepted approach based upon energy considerations.

QC1.15 The response to question QC1.9 refers to only ASME Section III Nuclear Class I piping. Describe similarly acceptable procedures for the determination of the maximum amplitude seismic loading cycles for the seismic design of Category I (seismic design) systems, componenents and equipment.

QC1.16 The use of a static load equivalent to the peak of the floor response spectra is not valid for the seismic design of Category I piping (QC1.10). Include either the contribution from all significant dynamic modes of response under seismic excitation or use a conservative dynamic load factor in the static analysis.

QC1.17 A comparison of the response spectra derived from the time history and the site seismic design response spectra for OBE has been included in the FSAR. A similar comparison for the DBE should also be provided for all damping ratios that were used in the seismic analysis. The DBE response spectra from the time history should envelope the site seismic design response spectra for all damping values.

APPENDIX G - RESPONSE TO AEC SAFETY GUIDES

QG7.4 Your responses in Amendments No. 2 and No. 5 to questions QG7.1 through QG7.3 provided additional information on the Containment Atmosphere Dilution (CAD) System. We find the system presently unacceptable unless the following additional information or commitments are provided:

a. Since you have not provided sufficient justification to allow normal plant operation with a limit of 5 v/o oxygen concentration in the containment, commit to limiting the oxygen concentrations to 4v/o during normal plant operations. This provides additional time before actuation of the CAD system.

b. You have not demonstrated that the CAD system has adequate redundancy. Specifically, (a) it is not clear that an adequate number of redundant wetwell H_2 and O_2 analyzers have been provided, (b) the redundancy of the nitrogen sources to the system has not been adequately explained, and (c) the operation of the CAD system is dependent on the control air system which is designed to less stringent criteria than the CAD system.

c. You have not provided sufficient justification that natural diffusion is adequate to ensure uniform mixing of hydrogen, nitrogen and oxygen in the containment atmosphere. We require that containment sprays be actuated periodically during the post-accident period to provide atmospheric mixing.

d. You should study means to assure that the peak containment repressurization pressure will be limited to a value substantially below the containment design pressure as recommended by the Advisory Committee for Reactor Safeguards (ACRS) for similar systems on other plants. Containment pressure limits should be clearly stated. If purging is to be used, purge rates and time for initiation of purge should be identified.

QG12.2 The response to question QG12.1 is inadequate to determine the typical response of components and equipment. The peak recording instrumentation provided is adequate for verifying the actual responses of the nuclear steam supply system and other

Category I piping systems with similar response characteristics. However, no instrumentation is specified for other types of components and equipment. Describe the supporting instrumentation such as peak recording accelerographs and peak deflection recorders to be installed on selected Category I components, other than piping, which will provide data for verification of calculated seismic responses of Category I components and equipment.

APPENDIX D - QUALITY ASSURANCE PROGRAM

OD1.20 The information in Appendix D to the FSAR and in the responses to our questions contained in Amendment No. 7 to the FSAR do not provide sufficient information to evaluate the adequacy of the Quality Assurance Program for Operations. Many of the requirements of Appendix B to 10 CFR 50 (or of ANSI N45.2-1971 and draft ANS 3.2 document dated November 2, 1972)[1] are not discussed adequately. Supplement the discussion of your quality assurance program as follows:

a. Provide a discussion of what IELP's QA/QC personnel in the headquarters and onsite staffs will do to satisfy the requirements of Appendix B to 10 CFR 50 (or all the provisions of ANSI N45.2 and draft ANS 3.2 of November 2, 1972) and discuss how this will be done during all post-construction phases including preoperational testing, fuel loading, startup and power ascension testing, full term operations, and during preventive and corrective maintenance, modification, repair, rework, potential design changes, purchase of safety-related articles and services, in-service inspection and other activities over the service life of the plant. This discussion should include a description of the specific organizational arrangements for the QA/QC personnel and other persons and groups involved in the implementation of the provisions of the above documents. The organization charts and attendant discussion should delineate the lines and areas of communication, responsibility, and authority of IELP's persons and organizations responsible for implementing the requirements which the QA Program must meet. The discussion should also describe the role of the NSSS and A/E during all post-construction phases up until the time IELP accepts and operates the plant.

b. The response to Question D1.4 in Amendment 7 is inadequate. Modify FSAR Figure D.2-1 to denote the organizational location of the IELP's QA organization. With reference to Figures 6.1-1 and 6.2-1, indicate the organizational location and arrangement of IELP's QA group with respect to both the onsite and offsite staffs and describe the role of these QA personnel relative to the Safety Committee and Operations Committee shown on Figure 6.2-1. Also, amplify this statement in D1.4 of Amendment 7: "these duties (of the IELP QA group) are the establishment, implementation, and verification of the Quality Program for DAEC."

[1] Both ANSI N45.2-1971 and the draft ANS 3.2 document on QA dated November 2, 1972, have been adopted by the U.S. Atomic Energy Commission for publication in the AEC Safety Guide No. 33 as an acceptable way to meet requirements of Appendix B, 10 CFR Part 50.

c. The response to Question D1.3 in Amendment 7 is inadequate inasmuch as it does not list procedures for vendor and supplier selection, vendor shipping inspection, and external audits. If these are covered in other manuals such as procurement manuals or engineering manuals, cross-reference may be made to the document title and document Reference No. in such manuals.

   Also provide a brief abstract of the scope and purpose of each procedure in the Duane Arnold QA Manual for Operations. Indicate the schedule for completion and implementation of each procedure.

d. The response to Question D1.5 in Amendment 7 is inadequate. Describe the design review role of IELP's QA Group and other technical specialists during facility operation and throughout all operational phase activities over the service life of the plant in assuring that conceptual designs, preliminary designs, details designs, and plant arrangement drawings and changes to these are properly reviewed in accordance with regulatory requirements to assure adequacy and inclusion of provisions for access, inspection, test, maintenance, and repair.

e. The response to Question D1.9 in Amendment 7 is inadequate in that it states "Source inspection will be provided by Quality Assurance when it is deemed necessary." Describe the policy and criteria for determining when source inspection is and is not deemed necessary relative to safety-related items and purchased services. Describe the policy and actions that will be taken by IELP to determine the validity and adequacy of the certification system that should exist in support of these certificates that attest to the adequacy of product.

f. The response to questions D1.12 in Amendment 7 is incomplete. Examples, by reference, of the U.S. Bureau of Standards calibration documents you intend to use should be provided. A complete discussion should be provided with regard to the recall system, the policy for storage and utilization of measuring, test, and calibration equipment in environments which do not adversely affect their accuracy, provisions for maintaining records, methods for indicating

calibration status of installed items and portable measuring and test equipment, and provisions for control of nonconformities, corrective action, examination of trends for assessing the adequacy of calibration intervals, and nature of the audits of the calibration system. Further, describe whether the procedures in your QA Manual include these concerns. Also, describe briefly the calibration facilities involved in the program and discuss staff size and qualifications of those who will carry out the calibration effort.

g. The response to question D1.19 in Amendment 7 should be supplemented to include a list of those activities to be audited by IELP's Quality Assurance Group and a description of the audit cycle.

APPENDIX N - RESPONSE TO RECURRENT QUESTIONS ON OTHER DOCKETS

QN2 The information presented in Section N.9.3 of the FSAR is inadequate to substantiate the value given for the permeability of near-surface soils in the vicinity of the plant, and in particular, between the plant and the Cedar River. Approximate data must be supplied to substantiate the selected value. If the value is an average or approximation, provide the range of permeabilities expected for ground water flow through near-surface soils from the plant to the Cedar River. If the highest conservative estimate of permeability exceeds 10^{-1} cm/sec, describe methods that could be employed to reduce travel time between the plant and the Cedar River following a postulated radioactive liquid release to the upper aquifer.

QN3 The information presented in N.12.21 of Appendix N to the FSAR on the sacrificial shield does not provide sufficient description of the analysis that was done to determine the resultant pressure of pipe breaks occurring within the sacrificial shield. The computer program and assumptions used in the calculations were not described. We will need the volume and vent area of the reactor cavity, the resultant pressure response and the blowdown rate and energy as a function of time, and a description of the computer program. The applicant should discuss whether homogeneous flow was assumed through the vents and whether choked flow was considered in determining the venting rate.

DAEC PREPAREDNESS PLAN

6. Flood Protection

We require protection procedures be prepared to meet flooding of the site. The procedures must be described or appropriately referenced in the Preparedness Plan if a separate contingency plan for flood protection is developed. We require that the flood protection procedures include the waterproofing of all plant accesses below elevation 770.5 feet MSL on the northerly sides of the safety-related structures, below elevation 773.7 feet MSL on the southerly sides of other safety-related structures, and below elevation 769 feet MSL on all other sides of other safety-related structures before water may reach plant grade. The procedures for protection must cover the contingency that leakage through any of the protected accesses could exceed the capacity of interior drainage facilities, and that such drainage facilities may require augmentation in the form of auxiliary pumps and fire hoses to prevent loss of safety-related equipment needed to maintain shutdown conditions. (See questions 2.35 and 2.36 for related requirements on flood protection.)